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ABSTRACT

Presented is a study of the influence of science instruction on the attitude of students to elect science courses at the secondary level. No relationship was found for seven high school groups between their science attitude and their years of science course instruction. (SL)

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The Influence of Science Instruction on the Attitude of Students Electing Science Courses

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Attitudes and Science Courses

SE 024 175

Abstract

The Influence of Science Instruction on the Attitude of Students Electing Science Courses

In this study the influence of science instruction on the attitude of students to elect science courses was tested by comparing a cross section of seven groups of high school students from varying science backgrounds. The groups were randomly selected from a population of average ability students as measured by SRA achievement tests. The groups consisted of the following: Freshmen; Sophomores; Juniors (two years of science instruction); Juniors (Three years of science); Seniors (three years of science); Seniors (two years of science); Seniors (four years of science instruction). An Attitude Measurement Response Test (AMRT) was designed to measure science attitudes compared to the years of science courses of instruction. No significant differences existed among the groups as evidenced by a one-way analysis of variance (ANOVA) procedure. Other environmental influences are implicated to affect the decision of students' attitudes toward electing science courses beyond the minimum for graduation.

The Influence of Science Instruction on the Attitude of Students Electing Science Courses

One of the basic goals of many teachers is to develop within students a positive attitude towards their subject. Science in particular has experienced a decline in students choosing science courses beyond the minimum requirements, both in high school and college. Many charges and counter charges have been made as to the causes for this response (National Assessment of Educational Progress, 1969-1970; Bridgham, 1972). One in particular is that of attitudes. Some suggest that course instruction is having a negative effect on students, especially in the required courses, and the result is that students do not want to elect science beyond the minimum. Furthermore, some suggest that course material is not relevant outside the classroom (Beers, 1973; Sutcliffe, 1973).

The effective and affective domain in science instruction has continued to strive to develop desirable attitudes related to science. Middle States, through its National Study of secondary school

evaluation (Note 1) offers this guiding principle which includes attitudes in the evaluation process. The basis of including such a principle lies in the psychology of attitudes and attitude measurement. Generally, positive attitudes permit growth, while negative attitudes hinder growth. (Hunter, 1954; Haney, 1964; Opinion Research Corporation, 1974).

With respect to this dimension of science instruction on the development of attitudes, students with positive attitudes will pursue science learning both in and out of the classroom, while students with negative attitudes are not interested in science beyond the requirements of their course of study. Furthermore, one of the main reasons students do not choose science courses when given the opportunity, is because of this negative attitude.

The issue of attitude measurement is not a new one. The difficulty in establishing a reliable instrument for attitude measurement appears to be related to the cognitive nature of attitudes. Furthermore, attitudes can mean different things to different people. They are bound with emotional

content and vary in intensity and generality in a given situation. In addition, attitudes are sometimes difficult to distinguish in themselves, apart from personality, interests, values, ideals, opinion, and socio economic status. (Haney, 1964) Indeed, perhaps even personality types also influence students' attitudes in electing science courses. (Rowe, 1978)

Appart from these difficulties, attitudes continue to be an important indicator for motivation and research. However, several techniques are generally used for measurement. Instruments involve direct observations, interviews, questionaires, and combinations thereof.

Thomas and Znaniecki (1918) used letters exchanged from Polish immigrants to develop an attitude scale to probe Polish attitudes on America.

Watson (1925) developed an instrument to measure attitudes of prejudice or twelve specific issues of governemnt. Response weights were assigned and tabulated for each issue to arrive at an attitude composite.

Allport and Hartman (1925) attempted to learn student attitudes on specific issues by opinionaire samples.

Harper (1927) studied the positive and negative attitudes of educators toward various social issues.

Likert (1932) developed scales and tabulated the average acceptance of the item and its correlation with the total score.

Attitudes scales were also developed to assess attitudes and motivation; while Edwards (1957) gave a general introduction to basic techniques of attitude scale construction.

Indeed, much of the research is centered on the techniques of attitude measurement, as well as the issues involved in the testing. Generally, studies indicate positive attitudes produce behavior which is favorable to motivation, while negative attitudes produce withdraw or negative behavior to the issues being tested. Also, no one factor has been found to contribute to the development of such attitudes. Many complicated and diverse

interactions help develop attitudes.

In education, attitudes have always been known to highlight behavior (Science Indicators Report, 1974).

One of the first attempts to measure attitudes on any school subject was by Remmers and Silance (1934). A multiple choice response instrument was devised by asking questions and having the student respond to items ranging from strong agreement to strong disagreement. These scales were then tabulated to assess the mean scores. Generally, the results indicated that a strong disagreement produced withdraw and hindered further growth by nature of the expressed behavior (Hunter, 1954). Single factors responsible for the attitudes could not definitely be identified.

Belt (1959) in measuring attitudes of pupils toward science and scientists, found that the majority had favorable attitudes. Further item analysis shows, generally, no single factor can be identified to produce the responses to the items (Science Indicators Report, 1974).

Research over the past three years indicates most studies in the area of attitude measurement pertain to the assessment of attitudes and achieve-

ment. Lucas (1974) found that students who scored high on aptitude and/or science achievement, also had positive scientific attitudes as determined by a Scientific Attitude Inventory developed for the study.

McKinnon (1974) also only assessed the academic aspects of attitude. Riley (1974) did likewise. Although the affective domain was implicated, the testing instrument did not pertain to experiences outside the classroom environment or related to behavioral objectives beyond the course of study.

Unfortunately, from Thomas and Znzniecki (1918) to the present, the general trend indicates a shift away from attitude measurement in relation to the the dimension with respect to the outside classroom environment. Obviously, the classroom is a place where attitudes are to develop, but not an exclusive one. To exclude the environment and behaviors outside the classroom in a measurement of attitudes, produces a distorted resolution of the problem.

The basic hypothesis concerns itself with the influence of required science instruction, that is, courses that students have no choice in selecting, on the attitude of the adolescent to elect more science courses in future years.

Method

Subjects. To study the influence of science instruction on the attitude of the high school student, seven groups of students, each randomly selected from a population of average ability as determined by Science Research Associates (SRA) achievement tests, 1972-1976 editions respectively, were formed. Homogeneously grouped students were assigned from the 45-55 percentile rankings. These seven groups consisted of Freshmen, Sophomores, Juniors, and Seniors, all within the same high school. All students take a minimum requirement of two years of science. The Freshman year is assigned the (IPS) Introductory Physical Science program, and the Sophomores are given the (BSCS) Biology, Yellow Version. Junior and Senior years are elective years for science, although no more science courses (Electives include Chemistry, Earth Science, Physics)

are required for graduation.

Some Juniors and Seniors take only the minimum required, others three and four years of science. Is there a significant difference in the attitudes among these groups that influenced their decision?

The seven groups are as follows: Freshmen; Sophomores; Juniors (two years of required science); Juniors (three years of science); Seniors (two years of required science); Seniors (three years of science); Seniors (four years of science).

The average Freshman age is 14 and progresses respectively to the average Senior age of 17. In the majority of cases, students have spent the first eight years in different Catholic elementary schools in the same community. Most of the feeder grade schools have an established science program. For the most part, students attending this school come from working class homes and relatively stable communities.

Procedure. To study the influence of science instruction on the attitude of students electing science courses, an "Attitude Measurement Response

Test" (AMRT) was designed, attempting to bring into focus the effective as well as affective domain of attitude developemnt toward specific behaviors relating to science experiences in everyday life and in the classroom. The instrument contains 18 statements that are marked TRUE for responses of agreement; FALSE for responses of disagreement; and NEUTRAL for a response of no opinion. The tests were administered by four different people: The experimentor in Freshmen science class, a biology teacher in Sophomore science, a history teacher to the Juniors, and a religion teacher to the Seniors. Students were instructed not to place their names on the instrument.

Tests were scored by the additon of correct responses, as determined by the designer, assigning (+) numbers to correct responses, negative (-) numbers for incorrect responses. The number of negative responses were subtracted from the number of positive responses to tabulate the final score. Positive attitudes are identified by by predetermined correct responses, negative attitudes by wrong responses. Neutral responses do not compute into the score.

Results

The null hypothesis that no significant difference exists among the groups as to the measurement of attitudes and the years of science courses taken, could not be rejected. (Refer to Tables 2 and 3) Students who have the requirement of two years of science, do not differ significantly in attitudes from students who elected more science courses.

	N	MEAN	MEDIAN	SD
Freshmen	35	6	10	8.5
Sophomores	53	8	10	9
Juniors (2 years of science)	29	5	6	9.5
Juniors (3 years of science)	83	9	9	9.5
Seniors (2 years of science)	20	5	12	13
Seniors (3 years of science)	57	6	9	8
Seniors (4 years of science)	52	6	9	9

TABLE 1

TABLE 2: ANOVA OF THE SEVEN GROUPS FROM TABLE 1.

SOURCE	Df	SS	MS	F
Between-groups	6	378	63	.74
Within-groups	322	27227	85	
Total	328	27605		

No significant difference exists in attitudes.

TABLE 3: ANOVA, Juniors and Seniors from Table 1.

SOURCE	Df	SS	MS	F
Between-groups	4	254	63.5	.76
Within-groups	236	19541	82.8	
TOTAL	240	19795		

Again, no significant difference exists in the attitude among the groups of students who elect science courses and those who take only the minimum requirements.

Discussion

The rather surprising finding of the study is that students who have the minimum requirement of science, are not significantly different in attitudes from students who elect more science courses. There is no clear resolution to this finding. However, the theory that negative attitudes have been developed in the first two requirement years of science instruction, is not supported by the data in this study. Furthermore, most students measured an overall positive attitude towards the science questions.

There are several cautions however that have to be noted in interpreting these data. For one, the reliability of the testing instrument has not been statistically determined. Also, a time series study in which the same students are followed and tested over four years of high school, rather than a cross section in one year such as this study has done, may yield different results.

Another issue which was not addressed by this study is that which would relate factors outside the classroom environment influencing students'

decision to elect science courses. Societal influences of the job market, parent pressure toward more practical job related skill courses, peer pressure, teachers grading practices, teaching styles and methods of presentation, all deserve attention to the development of attitudes and electing science courses or not. The answers to these questions can only be determined by exploring a wider range of factors within and outside the science classroom.

In conclusion, there is no clear resolution, at present, on the question of how positive attitudes develop and influence students electing science courses beyond the minimum requirements, nor how they may be fostered and evaluated within the curriculum and without.

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ATTITUDE MEASUREMENT RESPONSE TEST (AMRT)

INSTRUCTIONS: Please answer the following statements as honestly as possible, giving (T) for true responses of agreement; (F) for false responses of disagreement; and (N) for a neutral response of no opinion. Your name on the test is not necessary.

1. I would like to visit the Franklin Institute to learn about the science exhibits.	1. T
2. It is not important for everyone to learn about science concepts in our modern world.	2. F
3. I think science and technology will destroy the human conditions of man and his environment.	3. F
4. Before I take a drug, I want to know about the physical effects and hazzards of the drug.	4. T
5. I would like to learn more about the scientific evidence on smoking and lung cancer.	5. T
6. I would enjoy watching an episode of the Undersea World of Jacques Cousteau.	6. T
7. When I visit the doctor and he prescribes medicine, I would not want to know how the medicine works and its side-affects on my body.	7. F
8. When my car breaks down, I am not interested in what made it break down, but on how much it will cost to repair.	8. F

ATTITUDE MEASUREMENT RESPONSE TEST (AMRT)

(CONTINUED)

9. The health aspects to smoking do not interest me.	9. F
10. I would enjoy taking more courses in science.	10. T
11. It is important for everyone to know about science concepts in order to vote on scientific issues like atomic energy and power plant construction.	11. T
12. I think science discoveries will help the human conditions of man.	12. T
13. I think science should be studied only by those who want to be scientists.	13. F
14. I would like to learn about how food is grown and produced.	14. T
15. I do not enjoy reading science books or magazines.	15. F
16. I would not consider learning more about drinking and alcohol addiction.	16. F
17. I like to read and know about the ingredients in the food I eat.	17. T
18. I do not think it necessary to learn about radiation from appliances in my home.	18. F

Thank you for your time and cooperation.